# Development of New Photometric Detection Methods for Liquid Chromatography



# 1993 Fiscal Year Final Research Report Summary

## Development of New Photometric Detection Methods for Liquid Chromatography

Research Project

### Project/Area Number

04557102

### Research Category

Grant-in-Aid for Developmental Scientific Research (B)

### Allocation Type

Single-year Grants

### Research Field

Physical pharmacy

### Research Institution

Kanazawa University

### Principal Investigator

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### Project Period (FY)

**1992 – 1993**

### Keywords

differential photometric detection / indirect photometric detection ion chromatography / inter-eluent separation factor / polyvalent base / differential chromatogram method / polarized photometric detection / polarizer / flow cell

### Research Abstract

(1) Indirect Photometric Detection : Hoover's model was proved theoretically with a new function, "inter-eluent separation factor". The resultant equation was useful for the prediction of retention times and peak intensities of analytes as well as system peaks. Addition of polyvalent bases such as triethylenetetramine (Trien) selectively reduced the retention time of sulfate ion. This effect was estimated theoretically according to complex formation mechanism between sulfate ion and polyvalent base. A preconcentration/indirect photometric detection ion chromatograph determined inorganic and organic anions simultaneously in ranges from 10^<-9> to 10^<-7> M levels. The problem of large base-line drift observed in indirect photometric detection ion chromatography with stepwise elution was removed effectively by the differential chromatogram method. This technique was also useful for single column ion chromatography using conductivity detection.
(2) Polarized Photometric Detection : The theoretical equation was obtained for the polarized photometric detection. According to this theory, two different flow cells, single cell having longer light pass length and inner diameter than those of conventional absorbance detector flow cell and split cell having two parallel flow cells were made. Although the detection limit was improved by the former cell, the ghost signal caused by refractive index effect was not negligible. The latter cell improved the detection limit without the above problem and was useful in the gradient elution system.

# Research Products (20 results)

All | Other

All | Publications (20 results)

[Publications] Kazuichi Hayakawa: "Preconcentration/Ion Chromatography with Indirect Photometric Detection for Anions" Anal.Sci.9. 419-421 (1993)

[Publications] Atsushi Yamamoto: "Adsorption Isotherm of Undissociated Eluent Acid and Its Relation to the Retention of System Peak in Non-suppressed Ion Chromatography" J.Chromatogr.644. 183-187 (1993)

[Publications] Kazuichi Hayakawa: "Theoretical Consideration on Polarized Photometric Detection" Biomed.Chromatogr.in press.

[Publications] Atsushi Yamamoto: "Enantiomeric Purity Determination by HPLC with Coupled Polarized Photometric/UV Detector" J.Chromatogr.(in press).

[Publications] Masayuki Nishimura: "Ion Chromatographic Study of Sulfate-triethyrenetetramine Complexes in Aqueous Solution" Anal.Sci.(in press).

[Publications] 宮崎元一: "総説:イオンクロマトグラフィーの公衆衛生関連領域への展開" 北陸公衛誌. 19. 1-7 (1992)

[Publications] 宮崎元一: "総説:イオンクロマトグラフィー-吸光度検出法の活用-その1概論" 温泉科学. 42. 89-95 (1992)

[Publications] 早川和一: "解説:炭酸をイオン分析する" ぶんせき. 1993. 375-378 (1993)

[Publications] 早川和一: "総説:イオンクロマトグラフィーにおける最近の進歩" 衛生化学. 40. 1-12 (1994)

[Publications] 早川和一: "各種分析法におけるサンプリング・試料調製法と前処理技術" 技術情報協会, 596 (1993)

[Publications] Kazuichi Hayakawa, Jun Kobayashi, Mikako Ohmori, Mayumi Ohya, Akio Kato, Motoichi Miyazaki: "Preconcentration/Ion Chromatography with Indirect Photometric Detection for Anions" Anal.Sci.9(3). 419-421 (1993)

[Publications] Atsushi Yamamoto, Akinobu Matsunaga, Eiichi Mizukami, Kazuichi Hayakawa, Motoichi Miyazaki: "Adsorption Isotherm of Undissociated Eluent Acid and Its Relation to the Retention of System Peak in Non-suppressed Ion Chromatography" J.Chromatogr.644. 183-187 (1993)

[Publications] Kazuichi Hayakawa, Atsushi Yamamoto, Akinobu Matsunaga, Eiichi Mizukami, Masayuki Nishimura, Motoichi Miyazaki: "Theoretical Consideration on Polarized Photometric Detection" Biomed.Chromatogr.(in press).

[Publications] Atsushi Yamamoto, Akinobu Matsunaga, Eiichi Mizukami, Kazuichi Hayakawa, Motoichi Miyazaki: "Enantiomeric Purity Determination by HPLC with Coupled Polarized Photometric/UV Detector" J.Chromatogr.(in press).

[Publications] Masayuki Nishimura, Morimasa Hayashi, Kazuichi Hayakawa, Motoichi Miyazaki: "Ion Chromatographic Study of Sulfatetriethyrenetetramine Complexes in Aqueous Solution" Anal.Sci.(in press).

[Publications] Motoichi Miyazaki: "Application of Ion Chromatography to Public Health Science Field" Hokuriku Journal of Public Health. 19(1). 1-7 (1992)

[Publications] Motoichi Miyazaki: "Ion Chromatography Use of Photometric Detection - 1 -" Onsenkagaku. 42(2). 89-95 (1992)

[Publications] Kazuichi Hayakawa, Kyoko Nomura, Motoichi Miyazaki: "Ion Chromatography of Carbonate-Carbon" Bunseki. 1993(5). 375-378 (1993)

[Publications] Kazuichi Hayakawa, Atsushi Yamamoto, Motoichi Miyazaki: "Recent Advances in Ion Chromatography" Eisei Kagaku. 40(1). 1-12 (1994)

[Publications] Kazuichi Hayakawa: Sampling/Sample Preparation and Pretreatment Techniques for Analytical Methods. Gijyutsujoho-kyoukai, (1993)